

#### REMARKS

In the July 18, 2007 Office Action, claims 1-7, 9-15, 17-20 and 24 were rejected. This Response amends independent claims 1, 9 and 20 and dependent claims 6 and 14. After entry of the foregoing amendments, claims 1-7, 9-15, 17-20 and 24 (18 total claims; 3 independent claims) remain pending in the application. Reconsideration of the application is respectfully requested in view of the above amendments and the following remarks.

#### DISCUSSION

Applicant appreciates the Office Action's withdrawal of all but one of the previously asserted grounds for rejection of the pending claims.

#### Rejection based on 35 USC §112

Applicant has corrected Claims 6, 14 and 20 appropriately, based on the Office Action. Applicant notes that Claims 20 and 23 are not subject to any other basis for rejection and request Notice of Allowability of these claims.

#### Rejection of Claims 1, 2, 9 and 10 under 35 USC §102(b) or 35 USC §103(a)

The Office Action maintains this ground for rejection. Applicant respectfully submits that the subject matter of the pending claims, as amended, overcome these bases for rejection.

The Aeromet Lasform(SM) process is described as "similar" to other stereolithography techniques such as SLA and SLS but with the advantage of creating a "fully dense" part *directly* without intermediate steps such as casting into a stereolithography mold or HIP or back-infiltrating with a low melting temperature alloy. Accordingly, the Lasform process directly produces a "fully dense" metal part, not a perform that has to be treated subsequently for densification and/or alloying to take place.

As to Claims 1 and 2, they recite re-solidifying to bind the base metal or its alloy with the alloying metal in a metallic mixture which is then heated at a temperature sufficient to melt the alloying metal and dissolve the base metal therein to form a hyper-eutectic liquid

composition. This contrary to Aeromet, which teaches that the advantage of its Lasform process is the elimination of such a step. Accordingly, the subject matter of Claims 1 and 2 is not anticipated because each and every claim feature is not present in Aeromet. Nor is the subject matter of Claims 1 and 2 obvious, because Aeromet teaches away from the claimed subject matter.

As to Claims 9 and 10, they recite building up a preform by spreading of a next layer to form additional stacked solid layers, heating the preform part at a temperature sufficient to melt said alloying metal and dissolve the base metal therein to form a hyper-eutectic liquid composition, and continuing to heat the hyper-eutectic liquid composition until it solidifies. This contrary to Aeromet, which teaches that the advantage of its Lasform process is the elimination of the requirement to heat a preform because there is no preform: Lasform produces a “fully dense” product *directly*. It also therefore cannot teach or suggest the step of continuing to heat a hypereutectic composition until it solidifies. Accordingly, Claims 9 and 10 are not anticipated and are not obvious in view of the teaching away of Aeromet.

Rejection of Claims 2, 3, 10 and 11 due to Abbot in view of Clement (and Rongti)

The scope and content of the prior art combination as asserted in the Office Action may be summarized as follows:

- Abbott (Aeromet) describes the Lasform(SM) process as “similar” to other stereolithography techniques such as SLA and SLS but with the advantage of creating a “fully dense” part *directly* without intermediate steps such as casting into a stereolithography mold or HIP or back-infiltrating with a low melting temperature alloy. Powder is heated to its melting point so that the powder is liquefied or “molten.” Abbott asserts that the Lasform process directly produces a “fully dense” metal part, not a preform that has to be heat treated subsequently for densification and/or alloying to take place.
- Clement describes a diffusion brazing assembly technique for articles of a titanium alloy that includes plugging a gap between the articles with a paste of a Ti-Cu-Ni alloy. The plug is then heated to a temperature between the melting

points of the two alloys, namely, between 1000 and 1300 °C, to densify it and to consolidate the titanium articles.

- o Rongti suggests 10 wt. % tin be added.

It is very apparent that the primary and secondary references are in conflict: Abbot makes a metallic part by a type of sintering process that melts a powder and that densifies the part formed from molten powder without subsequent heating. Clement describes a Ti-Cu-Ni alloy that can be used as essentially a joining material that is laid down between titanium alloy parts but that must be heated subsequently to cause joining together of the parts. The joining material requires heating for densification. Accordingly, the teachings of Aeromet and Clement are in conflict about a heating step for densification.

There are several differences between the prior art combination and the claimed subject matter. For example, one might expect that substitution of the Ti-Cu-Ni powder of Clement for the powder of Abbot in the Lasform process would mean that any Ti-Cu-Ni alloy with a composition within the range described in Clement would be directly formed and fully densified, not requiring post-formation heating. However, the Office Action asserts the powder composition of the present application is like that of Clement, and yet the claims presented indicate a need for post-formation heating to provide densification. This is contrary to the expectation based on the teachings and suggestion of both Abbott and Clement that such post-formation densification would not be necessary.

Another difference lies in the recited steps of the claimed methods. For example Claims 2 and 3 recite re-solidifying to bind the base metal or its alloy with the alloying metal in a metallic mixture which is then heated at a temperature sufficient to melt the alloying metal and dissolve the base metal therein to form a hyper-eutectic liquid composition. This is contrary to Aeromet, which teaches that the advantage of its Lasform process is the elimination of such a step. The combination does not teach that when the Lasform process of Abbot is used on Clement's Ti-Cu-Ni alloy (with tin of Rongti), it would deprive the process of the ability to "directly" produce a "fully densified" metal product. Accordingly, the substitution of

Clement's alloy powder (with tin of Rongti) into Abbot's process, if it were made, would lead to quite unexpected results. This is an indicator of non-obviousness.

As to Claims 10 and 11, they recite building up a preform by spreading of a next layer to form additional stacked solid layers, heating the preform part at a temperature sufficient to melt said alloying metal and dissolve the base metal therein to form a hyper-eutectic liquid composition, and continuing to heat the hyper-eutectic liquid composition until it solidifies. This contrary to Aeromet, which teaches that the advantage of its Lasform process is the elimination of the requirement to heat a preform because there is no preform: Lasform produces a "fully dense" product *directly*. The combination does not teach that when the Lasform process of Abbot is used on Clement's Ti-Cu-Ni alloy (with tin of Rongti), it would deprive the process of the ability to "directly" produce a "fully densified" metal product. Accordingly, the substitution of Clement's titanium alloy powder with tin of Rongti into Abbot's process, if it were made, would lead to quite unexpected results. This is an indicator of non-obviousness.

All of the requirements of a *prima facie* case not being met, Applicant respectfully requests reconsideration and withdrawal of this basis for rejection of Claims 2, 3, 10 and 11. To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation to modify a reference or to combine the teachings of multiple references. Second, there must be a reasonable expectation of success. Third, the prior art must teach or suggest all of the recited claim limitations. These three criteria are not met.

#### Rejection of Claims 4, 5, 7 and 15 due to Abbott in view of Clement in view of Blue

The Office Action asserts that Blue discusses "filler alloys" and that temperature is a result-effective variable. Thus it asserts that of temperature for solidification and homogenization is obvious. However, as discussed above with respect to Claims 1 and 9, the parent of the respective dependent claims, the combination of Abbott in view of Clement fails to render these independent claims obvious. Accordingly, their respective dependent Claims are not obvious for this reason at least. For brevity, other reasons will not be detailed here.

#### Rejection of Claims 12 and 13 due to Abbott in view of Clement and Rongti in view of Blue

The Office Action asserts that Blue discusses “filler alloys” and that temperature is a result-effective variable. Thus it asserts that of temperature for solidification and homogenization is obvious. However, as discussed above with respect to Claim 9, the parent of these dependent claims, the combination of Abbott in view of Clement fails to render Claim 9 obvious. Accordingly, dependent Claims 11 and 12 are not obvious for this reason at least. For brevity, other reasons will not be detailed here.

Rejection of Claim 17 due to Abbott in view of Clement in view of Marcus

The Office Action asserts that Marcus describes powder layer thickness and that it would be obvious to select a thickness within ranges disclosed. However, as discussed above with respect to Claim 9, the parent of Claim 17, the combination of Abbott in view of Clement fails to render Claim 9 obvious. Accordingly, dependent Claim 17 is not obvious for this reason at least. For brevity, other reasons will not be detailed here.

Rejection of Claim 18 due to Abbott in view of Clement in view of Das

The Office Action asserts that the Abstract of Das describes laser powder sintering followed by hot isostatic pressing. However, as discussed above with respect to Claim 9, the parent of Claim 18, the combination of Abbott in view of Clement fails to render Claim 9 obvious. Accordingly, dependent Claim 18 is not obvious for this reason at least. For brevity, other reasons will not be detailed here.

Rejection of Claims 18 and 19 due to Abbott in view of Clement in view of Huang

The Office Action asserts that the Huang describes laser powder sintering followed by hot isostatic pressing at temperatures exceeding 1800 °C. However, as discussed above with respect to Claim 9, the parent of Claims 18 and 19, the combination of Abbott in view of Clement fails to render Claim 9 obvious. Accordingly, dependent Claims 18 and 19 are not obvious for this reason at least. For brevity, other reasons will not be detailed here.

Comments on the Examiner’s Responsive Remarks in the Office Action

Applicant appreciates the Examiner’s Response to the explanations that Applicant provided previously. In paragraph 1, the Examiner addresses a perceived lack of sequence in

the steps of the claimed methods. Applicant notes that a sequence may readily be inferred for some steps of the claims (as amended) because these steps refer back to products or features of another step that must therefore be a preceding step. For example, Claim 1 recites re-solidifying and thereby binding the alloying metal in a metallic mixture which is then subjected to a temperature sufficient to melt the metallic alloy, dissolve the base metal therein and form a hyper eutectic composition. This is a feature not found in the cited art combinations.

#### CONCLUSION

In conclusion, for the reasons given above, all claims pending in the application are believed allowable and such allowance is respectfully requested. Should the Examiner have any questions or wish to further discuss this application, Applicant requests that the Examiner contact the undersigned attorney at (480) 385-5060.

If for some reason Applicant has not requested a sufficient extension and/or has not paid a sufficient fee for this response and/or for the extension necessary to prevent abandonment on this application, please consider this as a request for an extension for the required time period and/or authorization to charge Deposit Account No. 50-2091 for any fee which may be due.

Respectfully submitted,

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